when the valve closure begins to be finally accomplished. The function of the muscular slips now described may be regarded as a double one—(*a*) to keep the flaps away from the ventricular walls, and thus to ensure the provision of an adequate space between the flap and the ventricular wall for the full development of the retro-valvular eddy, and (*b*) to afford by their contraction direct mechanical assistance in the raising of the flaps into the position of final closure.

Geological Society, February 24.—Dr. A. Smith Woodward, president, in the chair.—Dr. J. E. **Marr**: The Ashgillian succession in the tract to the west of Coniston Lake. The author has studied in detail the succession of the Ashgillian strata in Ashgill Beck and the adjoining tract. An account of the lithological characters and lists of the fossil contents of the various divisions are given, and confirmatory sections from Coniston Village to Appletreeworth Beck are described. A comparison is made with the beds of the Cautley district, previously described by the author. Some fossils which have not yet been found in the Lower Ashgillian of the Cautley district occur in the beds of that division at Coniston. From a study of the fossils of the Coniston tract and of other areas in Britain and the Continent, it would appear that a twofold division of the Ashgillian strata which is of more than local value may be made. The lower division is characterised by the abundance of *Phillipsinella parabola,* and the upper by the profusion of *Phacops mucronatus.*—H. S. **Shelton**: The radio-active methods of determining geological time. The author holds that the radio-active method of determining geological time, while of great interest, is not of such certainty as to be independent of confirmation from other lines of investigation. The various radio-active methods, helium ratios, lead ratios, and pleochroic haloes are severally examined, and the various sources of uncertainty, general and particular, are pointed out. The most important general cause of uncertainty is to be found in the fact that mechanical and chemical changes of composition in minerals are the rule rather than the exception; and, in instances where constancy of composition throughout long periods of geological time is asserted, the burden of proof lies with those who make the assumption. The attempt to assess exact, or even approximate times by means of lead ratios is premature and entirely invalid. At the same time, the weight of the evidence is such as to render it exceedingly probable, so far as radio-active evidence goes, that geological time must be reckoned at least in hundreds of millions of years. There is a high degree of improbability that the errors in the radio-active methods should always be errors of over-estimation. The next step in the investigation of the time problem is to be found in a reversion to other lines of reasoning. The sea-salt methods, and those based on the thickness of the sedimentary rocks in particular, need careful reconsideration. Reference is made to a number of papers which show that the first of these is worthless, and the second based on a misapprehension of the nature of deposition. The argument from tidal retardation is still of value, as also is that from the evolution of carbonate of lime. To the author radio-active experiments come as a confirmation of views held on other grounds, but are not sufficiently important in themselves to be authoritative against the balance of the evidence derived from other lines of investigation.

Mathematical Society, March 11.—Sir Joseph Larmor, president, in the chair.—Prof. E. W. **Hobson**: Some theorems in the theory of series of orthogonal functions.—Major P. A. **MacMahon**: Investigations in the theory of the partition of numbers by a new method of partial fractions.—Col. R. L. **Hippisley**: Reciprocal and parallelogram linkages.—Dr. J. R. **Wilton**: A pseudo-sphere the equation of which is expressible in terms of elliptic functions.—T. C. **Lewis**: Circles and spheres, etc., associated with a triangle, orthocentric tetrahedron, etc.

PARIS.

Academy of Sciences, March 8.—M. Ed. Perrier in the chair.—The President announced the death of Prof. Hittorf, foreign associate.—A. **Leduc**: Diffraction phenomena and the motion of the earth. Pointing out an error in the calculations of Mascart in his memoir on the modifications undergone by light by reason of the movement of the source or the observer.—Emile **Saillard**: Catalysis in the oxidation of the alkaline sulphites. The oxidation of alkaline sulphites is retarded by the presence of saccharose, invert sugar, and other bodies, and accelerated by rise of temperature. The practical bearing of these observations on the process of sugar refining is discussed.—Maurice **Lugeon** and Gerhard **Henny**: The Canavese zone and the southern limit of the Alps.—Med. **Gard**: A hybrid of *Fucus ceranoides* and *F. vesiculosus.*—M. **Weinberg**: Researches on gas gangrene. In the majority of cases the organism producing the disease is *B. perfringens.* A description of the preparation of a vaccine and an antiserum (through the horse) is given; the latter appears to offer the most promising results.—Agasse **Lafont,** M. **Desmoulins,** and F. **Heim**: Pneumokoniosis in metal polishers.

BOOKS RECEIVED.

A Handbook to the Collection of Kaolin China-Clay and China-Stone in the Museum of Practical Geology, Jermyn Street, London, S.W. By J. A. Howe. Pp. viii+271. (London: H.M.S.O.; E. Stanford, Ltd.) 3*s.* 6*d.*

A Pocket Synopsis of the Families of British Flowering Plants (Based upon the System of Engler). By W. B. Grove. (Manchester University Press; London: Longmans and Co.) 1*s.* net.

A Birdlover's Year. By the Hon. Gladys Graham Murray. Pp. viii+150. (London: Eveleigh Nash.) 3*s.* 6*d.* net.

My Life. By Sir Hiram S. Maxim. Pp. ix+322. (London: Methuen and Co., Ltd.) 16*s.* net.

Annuaire Astronomique et Météorologique pour 1915. Pp. 436. (Paris: E. Flammarion.)

Carnegie Institution of Washington. Year Book No. 3, 1914. Pp. xvi+399. (Washington: Carnegie Institution.)

The Idols. By R. Rolland. Pp. 12. (Cambridge: Bowes and Bowes.) 6*d.* net.

A Manual of Oils, Resins, and Paints. By Dr. H. Ingle. Vol. i. Analysis and Valuation. Pp. 129. (London: C. Griffin and Co., Ltd.) 3*s.* 6*d.* net.

Geometry of Building Construction. Second Year Course. By F. E. Drury. Pp. xii+226. (London: G. Routledge and Sons, Ltd.) 3*s.* net.

Canada. Department of Mines. Mines Branch. Gypsum in Canada: its Occurrence, Exploitation, and Technology. By L. H. Cole. Pp. x+256. (Ottawa: Government Printing Bureau.)

Canada. Department of Mines. Geological Survey. Memoir No. 38. Geology of the North American Cordillera at the Forty-ninth Parallel. By R. A. Daly. Part i. Pp. xxvii+546. Part ii. Pp. xxvii+547–857. Part iii. Sheets 17. (Ottawa: Government Printing Bureau.)

The Counties of Moray and Nairn. By C. Matheson. Pp. x+139. (Cambridge: At the University Press.) 1*s.* 6*d.* net.

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The Counties of Clackmannan and Kinross. By J. P. Day. Pp. viii+145. (Cambridge: At the University Press.) 1*s*. 6*d*. net.

The Teaching of Geography. By B. C. Wallis. Pp. viii+221. (Cambridge: At the University Press.) 3*s*. 6*d*. net.

Molecular Association. By Dr. W. E. S. Turner. Pp. viii+170. (London: Longmans and Co.) 5*s*. net.

Ancient Hunters and their Modern Representatives. By Prof. W. J. Sollas. Second edition. Pp. xxiii+591. (London: Macmillan and Co., Ltd.) 15*s*. net.

Sun Lore of All Ages. By W. T. Olcott. Pp. xiii+346. (New York and London: G. P. Putnam's Sons.) 10*s*. 6*d*. net.

English Folk-Song and Dance. By F. Kidson and M. Neal. Pp. vii+178. (Cambridge: At the University Press.) 3*s*. net.

German Culture: The Contribution of the Germans to Knowledge, Literature, Art, and Life. Edited by Prof. W. P. Paterson. Pp. x+384. (London and Edinburgh: T. C. and E. C. Jack.) 2*s*. 6*d*. net.

DIARY OF SOCIETIES.

THURSDAY, March 18.

Royal Society, at 4.30.—Bakerian Lecture: X-rays and Crystals: Prof. W. H. Bragg.

Royal Institution, at 3.—The Form and Structure of the London Basin: Dr. A. Strahan.

Royal Society of Arts, at 4.30.—The Indian Army: Lieut.-Colonel A. C. Yate.

Institution of Mining and Metallurgy, at 8.—Annual General Meeting—Presidential Address: Sir Thomas Kirke Rose.

Linnean Society, at 5.—Hollow-shafted Feathers: W. M. Webb.—The Lichens of South Lancashire: J. A. Wheldon and W. G. Travis.—Coloured Drawings and Lantern Slides of 36 British Orchids: E. J. Bedford.—A Few Australian Plants: Dr. A. B. Rendle.

Institution of Petroleum Technologists, at 8.—The Internal Combustion Engine on the Oilfield: F. G. Rappoport.

Institute of Metals, at 3.—A selection of the following papers:—Some Experiments upon Copper-Aluminium Alloys: J. H. Andrew.—The Constitution of the Alloys of Copper with Tin. Parts I. and II.: J. L. Haughton.—Etching Re-Agents and Their Applications: O. F. Hudson.—The Effects of Heat and of Work on the Mechanical Properties of Metals: Prof. A. K. Huntington.—The Quantitative Effect of Rapid Cooling upon the Constitution of Binary Alloys. Part III. (Conclusion): Dr. G. H. Gulliver.—The Properties of Some Nickel-Aluminium and Copper-Nickel-Aluminium Alloys: Prof. A. A. Read and R. H. Greaves.—Some Appliances for Metallographic Research: Dr. W. Rosenhain.—The Micro-Chemistry of Corrosion. Part III. The Alloys of Copper and Zinc: S. White.

FRIDAY, March 19.

Royal Institution, at 9.—The Modern Piano Player—Scientific Aspects: Prof. G. H. Bryan.

Institution of Mechanical Engineers, at 8.—The Chemical and Mechanical Relations of Iron, Cobalt, and Carbon: Prof. J. O. Arnold and Prof. A. A. Read.

Institute of Metals, at 10.30 a.m. and 3 p.m.—A Selection of the Papers enumerated above.

SATURDAY, March 20.

Royal Institution, at 3.—Recent Researches on Atoms and Ions: Sir J. J. Thomson.

MONDAY, March 22.

Royal Society of Arts, at 8.—House Building: M. H. Baillie Scott.

Royal Geographical Society, at 8.30.—Spitsbergen in 1914: Dr. W. S. Bruce.

TUESDAY, March 23.

Royal Institution, at 3.—The Belief in Immortality among the Polynesians: Sir J. G. Frazer.

Zoological Society, at 5.30.—Exhibition of Partridges and other Game Birds: W. R. Ogilvie-Grant.—Contributions to the Anatomy and Systematic Arrangement of the Cestoidea.—XVI. On Certain Points in the Anatomy of the Genus *Amabilia* and of *Dasyurotaenia*. Dr. F. E. Beddard.—The True Coracoid: R. Lydekker.—The Artificial Formation from Paraffin Wax of Structures resembling Molluscan Shells: J. T. Cunningham.—On Two new Species of *Polyplax* (Anoplura) from Egypt: Bruce F. Cummings.

Institution of Civil Engineers, at 8.—*Discussion:* The Improvement of the River Clyde and Harbour of Glasgow, 1873–1914: Sir Thomas Mason.—*Probable Paper:* On Impact Coefficients for Railway Girders: C. W. Anderson.

WEDNESDAY, March 24.

Royal Society of Arts, at 5.30.—The Work of the War Refugees' Committee: Lady Lugard.

Institution of Naval Architects, at 11 a.m.—The Watertight Subdivision of Ships: Prof. J. J. Welch.—The Increase of Safety Afforded by a Watertight Deck: K. G. Finlay.—At 3 p.m.—The Influence of Discharging Appliances on the Design of Large Ore-Carriers: J. Reid.—The Scantlings of Light Superstructures: J. Montgomerie.—On the Strength and Spacing of Transverse Frames: C. F. Holt.

Geological Society, at 8.—The Stratigraphy and Petrology of the Lower Eocene Beds of the North-Eastern Part of the London Basin: P. G. H. Boswell.

THURSDAY, March 25.

Royal Society, at 4.30.—*Probable Papers:* On Forms of Growth resembling Living Organisms and their Products slowly deposited from Metastable Solutions of Inorganic Colloids: Prof. B. Moore and W. G. Evans.—The Production of Growths or Deposits in Meta-stable Inorganic Hydrosols: Prof. Moore.—A Contribution to our Knowledge of the Chemistry of Coat-Colour in Animals and of Dominant and recessive Whiteness: H. Onslow.

Royal Institution, at 3.—The Ground beneath London: Dr. A. Strahan.

Child Study Society, at 6.—The Care of the Teeth: C. E. Wallis.

Institution of Electrical Engineers, at 8.—Telephone Troubles in the Tropics: W. L. Preece,

Institution of Naval Architects, at 11 a.m.—A Contribution to the Theory of Propulsion and the Screw Propeller: F. W. Lanchester.—A Comparision between the Results of Propeller Experiments in Air and Water: A. W. Johns.—Further Model Experiments on the Resistance of Mercantile Ship Forms: The Influence of Length and Prismatic Coefficients on the Resistance of Ships: J. L. Kent.—At 3 p.m.—The Law of Fatigue Applied to Crankshaft Failures: C. E. Stromeyer.—The Effect of Beam on the Speed of Hydro-Aeroplanes: L. Hope.—Notes on the Cross Curves and GZ Curves of Stability: E. F. Spanner.

FRIDAY, March 26.

Royal Institution, at 9.—Experiments in Slow Kathode Rays: Sir J. J. Thomson.

Geologists' Association, at 8.—On the Structure of the Eastern Part of the Lake District: J. F. N. Green.

SATURDAY, March 27.

Royal Institution, at 3.—Recent Researches on Atoms and Ions: Sir J. J. Thomson.

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